Space Weather Forecast

Issued on Sunday, 24 July 2022 at 13:10 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Risk of Minor Geomagnetic Storms abating, but ongoing Slight Chance of Moderate class flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has remained low through the last 24 hours, with activity confined to peaks of mid common-class. These flares included one at 23/2241UTC and another at 24/0724UTC, with both of these appearing to emanate from the vicinity of a now departed sunspot region on the northwestern solar horizon, with the latter perhaps also bolstered by a concurrent southwestern solar horizon 'prominence eruption' Coronal Mass Ejection (CME). This prominence eruption has yet to be modelled, pending further imagery.

Satellite imagery was otherwise dominated in the 24 hours by a large far-sided CME. The bulk of ejecta from this event was visible heading southwest in the plane of the sky, with a more subtle portion also heading northeast. To complicate matters however, there was a possible candidate for a 'filament eruption' that immediately preceded this far-sided event on the southwest of the Earth-facing side of the Sun. The pattern of ejecta has been analysed extensively, and so far there is no conclusive tie to any front-sided CME, however this is actively being confirmed.

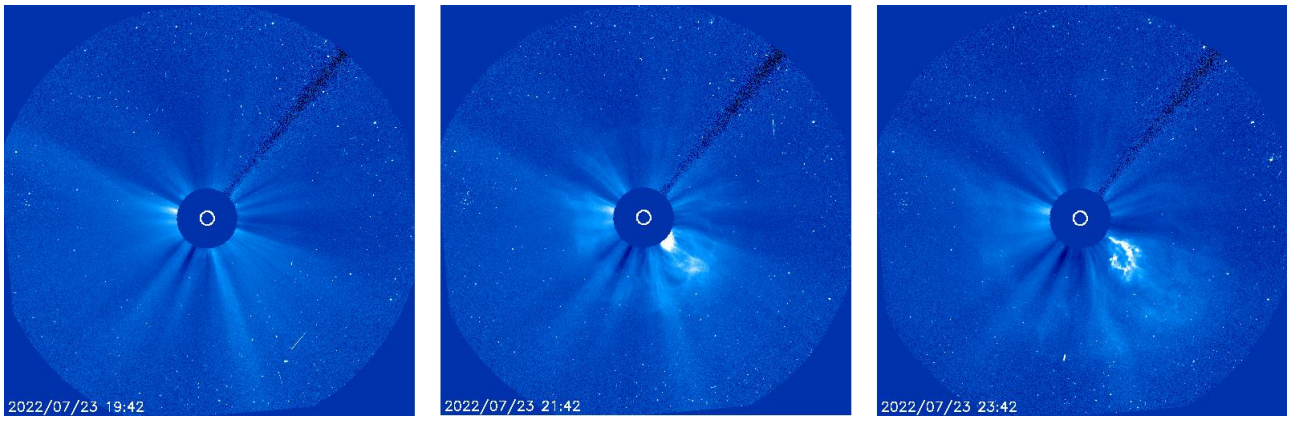

Figure 1: False colour satellite imagery sequence of the aftermath of a far-sided Coronal Mass Ejection. A full-halo shock is visible as an outward-exanding faint white circle. The main core of the CME is also seen as the hook-shaped feature heading southwest. Ejecta tied to this event is dominating the current field of view of this satellite and complicating identifying any minor front-sided CMEs in the period.

As a further subtlety, there was another faint emission seen heading along the earlier track of the main southwestern portion of the far-sided CME. While not conclusive, this may be from a similar location to the earlier far-sided event.

At present then, no Earth-bound CMEs are envisaged, however this statement carries lower-than-

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average confidence.

The Sun was populated by six sunspot regions, with one re-emerging from an earlier faded remnant - the main dynamic feature on the disc now the one responsible for the common class of the period flares has rotated off. The remainder of the sunspot regions were all relatively uncomplicated magnetic dipoles, with two other unipolar groups unchanged.

Solar Wind / Geomagnetic Activity: The solar wind was characteristic of the tail end of influence of the 21 July CME, possibly segueing into the earlier incumbent high speed stream from one of a pair of 'coronal holes'. The CME itself arrived at Earth prior to this 24-hour period, at 23/0258UTC.

The solar wind speed showed an erratic tendency in the Elevated range in the period. The number of particles comprising the solar wind fell slightly over the same interval into typical background range. The magnetic field associated with these particles showed a relatively stable magnitude within normal values. The north-south component of this field possibly completed a damped sweep through aligned to mainly anti-aligned (with Earth's field) in a possible weak 'magnetic cloud' signature sometimes seen in CMEs, however the net result of the above solar wind measures was below Minor Geomagnetic Storm G1 throughout.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Activity is likely to remain low, with a daily slight chance of moderate-class flares. Barring development, two further regions should leave the Earth-facing side of the Sun in the period, however the eastern solar hemisphere's far side is congested with the expected returning sunspot locations, such that activity ought to be maintained, pending proper analysis of any arrivals.

Solar Wind / Geomagnetic Activity: The 21 July CME is now largely thought to have passed. At present, no further Earth-bound CMEs feature in the forecast, however this carries lower confidence than is typical, and further analyses are being conducted.

The current high speed stream is the only one to feature in the forecast, and should wane in earnest to start the coming UTC working week. Quiet conditions should predominate from day three, Tuesday 26 July.

Energetic Particles / Solar Radiation: No solar radiation storms are expected.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	10	10	10	10
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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